A HYDROPHILIC COTTON PRODUCT COMPRISING A SOFT SURFACE AND A ROUGH SURFACE

The invention relates to a product of hydrophilic cotton made up entirely of cotton fibers and intended in particular for cosmetic use, application of makeup to the skin and/or removal of makeup from the skin.

Most cotton products available on the market are in the form of cut out formats, round, oval, or square for makeup removal and have outer surfaces of identical fibrous composition. When these products are used it is not possible to differentiate in use between the two surfaces of the product if it is desired, for example, to use one surface for application of a liquid in the form of a lotion or cream and the other surface for makeup removal by wiping and rubbing gently.

French Patent Application No. 0 750 062 describes articles for cleaning the skin which are both soft to the touch and strong enough to allow rubbing of the skin without causing irritation or breaking of this skin. The act of rubbing makes it possible to eliminate impurities and dead skin cells on the surface of the skin. These articles comprise a nonwoven substrate, preferably hydroentangled, with a square meter weight (grammage) of 20 to 150 g/m^2 and are characterized by a specific

friction coefficient. By preference the substrate comprises at least in part long fibers susceptible to being separated from the main surface as a result of the action of friction while remaining attached to the substrate. This substrate may be made up of a mixture of hydrophilic and hydrophobic fibers or entirely of hydrophilic or entirely of hydrophobic fibers.

At least one of the surfaces of the article or of the substrate used ensures performance essentially of the function of cleaning the skin. Should the skin cleaning article be made up of this substrate only, there is no difference between the two surfaces of the article and each surface may be used without distinction for cleaning the skin.

European Patent Application No. 0 851 052 discloses a makeup removal pad of cotton especially for cosmetic use comprising at least two layers. In order to prevent loss of fibers while retaining the quality of softness and absorption, the fibers of the outer layers are longer than those of the center layer or layers. The thickness of the central layer or layers by preference is greater than the thickness of the outer layers. In addition, such products do not have different surfaces permitting specific use of each surface.

Cotton makeup removal products most often comprise a mixture of cotton fibers of different qualities or a mixture of cotton and other fibers, depending on the product sought or

production process used. Such products are uniform in composition over their entire thickness. Certain other products are made up of several layers or sheets. The foregoing shows, however, that in effect the two outer layers are always identical in composition and may not be differentiated.

There is a need for cotton products having two surfaces permitting differentiation in use of the two surfaces, cosmetic use in particular, one surface for makeup removal from the skin or cleaning of the skin and one surface for makeup by application of product to the skin.

In the area of cleaning by wiping European Patent Application No. 0 826 811 proposes a complex nonwoven absorbent material having one smooth and one rough surface. This material is made up of at least two fibrous sheets one superimposed on the other and interconnected by interpenetration of fibers through the thickness. The first sheet, however, is made up wholly or partly of thermofusible synthetic fibers selected by preference from the category of polyolefins, while the second sheet is made up of natural and/or artificial and/or synthetic fibers finer than the fibers of the first sheet. The synthetic fibers entering into the composition of the first sheet make it possible to raise the nap of the surface of the article (make it "scratchy"). This "scratchy" effect is obtained by reorientation of the synthetic

fibers in order to have free ends or curls visible on one outer surface and by fusion of the free ends of the synthetic fibers.

This product is not intended for cosmetic use but rather for making semi-caustic or highly absorbent wiping products.

The object of the invention is to provide a cotton makeup removal product comprising two different surfaces. A first surface is rated as rough and performs the function of cleaning the skin, in particular for the purpose of makeup removal, for example, with the assistance of a lotion. The other surface is soft and permits application of a makeup product, a lotion or a cream, to the face or the skin. The surfaces are differentiated essentially by the touch and, if necessary, visually.

Another object of the invention is to propose a "natural" product consisting of natural fibers only, without the addition of artificial and/or synthetic fibers or of a bonding agent, and also to permit easy recycling of the trimmings produced during the manufacturing process.

The object of the invention is creation of a hydrophilic cotton product which is made up entirely of cotton fibers comprising at least a first and a second outer layer.

One essential feature of the invention is that the first layer consists of fine fibers exhibiting a low micronaire value and forming a soft surface, while the second layer is made up of

fibers exhibiting a higher micronaire value and forming a rough surface.

The micronaire value represents the average mass of the fibers per unit length, µg/inch, of a tested sample of cotton product. This value is directly linked to the mean cross-section of the fibers. It defines the thickness of the cotton fiber and is measured by means of a measuring device such as the Sheffield Micronaire. More information concerning this value and the method of measuring it is given in the following description.

A more specific characteristic of the invention is that the first outer layer has a micronaire value ranging from 2 to 5 µg/inch, while the second outer layer has a micronaire value ranging from 4 to 10 µg/inch, the difference between the micronaire values of the two outer layers being at least 1 µg/inch.

One preferred characteristic of the invention is such that the first layer has a micronaire value ranging from 2.8 to 4.2 µg/inch and the second has a micronaire value ranging from 5 to 8.5 µg/inch.

Another characteristic of the invention is that the outer layers have a grammage (square meter weight) of at least 8 g/m^2.

One advantageous characteristic of the invention is that the product also comprises at least one center layer positioned between the two outer layers.

In order to make it easier to distinguish the surfaces one characteristic of the invention is that the outer layers have grooves on the surface, the spaces between the grooves of one of the layers being smaller than the spaces between the grooves of the other layer.

The invention also has the object of providing a process for production of a hydrophilic cotton product as claimed for the invention the outer layers of which include grooves on the surface.

An essential characteristic of this process is that each outer layer is hydroentangled by means of streams of water the axes of which are spaced at specific distances from each other, the distance between the streams used for the first layer differing from that between the streams used for the second layer so as to obtain outer layers having grooves on the surface spaced at different intervals.

Other characteristics and advantages of the invention will be discussed in greater detail in the following description with reference to the attached drawings, in which

FIG. 1 presents a diagram of a cross-section of an embodiment of the product claimed for the invention comprising two layers of cotton;

FIG. 2 a diagram of a cross-section of an embodiment of the product claimed for the invention comprising three layers;

FIG. 3 a diagram of a cross-section of an alternative embodiment of the product claimed for the invention shown in FIG. 2;

FIG. 4 a diagram of a cross-section of another alternative embodiment of the product claimed for the invention shown in FIG. 2;

FIG. 5 a diagram of a cross-section of an embodiment of the product claimed for the invention comprising four layers;

FIG. 6 a product claimed for the invention having grooves spaced at different intervals;

FIG. 7 a diagram of the surface of a perforated plate of a hydroentangling device in which the plate is perforated with holes in a specific sequence.

The product claimed for the invention is made up entirely of natural cotton fibers and comprises at least two layers each presenting an outer surface.

The first layer consists of fine, soft fibers with a low micronaire value.

The second layer, in contrast, is made up of fibers larger in cross-section with a higher micronaire value and accordingly exerting a scraping effect.

Several factors such as the linear density and the maturity of the cotton fibers may vary and affect the micronaire values.

The micronaire value is measured by means of an appliance such as the Sheffield Micronaire in accordance with a specific method such as that set forth in ISO 2403 or NF G 07-073.

This micronaire value serves to define the fineness of cotton fibers. Its measurement is based on the permeability of a mass of cotton by air under certain specific conditions, on an arbitrary scale called micronaire scale calibrated by means of a number of varieties of cotton (about ten standard cotton varieties) to which micronaire values have been assigned by International agreement. Measurement is made of the permeability by air of a given example taken from an outer layer of the product claimed for the invention (constituting the test sample) by reading the resistance to passage of air flow indicated by the air-flow apparatus on a scale graduated on the basis of variations in the air flow rate or differences in pressure. This scale has been previously calibrated with a series of reference cottons.

The appliance comprises a balance for measurement of the mass of the test sample, an air flow device by means of which the

micronaire value may be measured, the device consisting of a perforated compression cylinder containing the test sample, a device required for measurement of the permeability by air of the test sample such as an air pump, means for controlling the air flow or pressure passing through the air sample in the compression cylinder, a pressure gauge for reading the required difference in pressure, and a flowmeter for reading the flow of air through the test sample, and if necessary a scale graduated in values of the micronaire value or a table reflecting conversion of the readings to micronaire values. Sampling and choosing test samples are conducted in accordance with the standards NF G 07-050 and NF G 07-062, for example.

The mass of the test sample is then determined. The test sample is introduced into the compression cylinder in uniform small amounts and the fiber compression piston is placed in position and locked. Air intake at the appropriate pressure or flow is initiated and the difference in pressure is read on the scale of the instrument.

In the case of equipment whose scale is graduated in micronaire values the mean value of the readings obtained is calculated for all the test samples taken from one given sample. In the case of equipment whose scale is graduated in units other than micronaire values the direct readings are converted to micronaire values on the basis of the conversion curve.

The micronaire values representing the mean mass of the fibers per unit length is expressed in µg/inch.

The first layer of the product claimed for the invention is made up of cotton fibers having a micronaire value ranging from 2 to 5 µg/inch, preferably 2.8 to 4.2 µg/inch.

The second layer is made up of cotton fibers having a higher micronaire value, one ranging from 4 to 10 µg/inch, preferably 5 to 8.5 µg/inch. For the sake of significant differentiation of the two surfaces of the product, it is believed that the difference in micronaire values of the two outer layers should be no less than 1 µg/inch.

For the purpose of illustrating the micronaire value a determination has been made of its correspondence in values of deci-tex, which is also a measure of the mass of a fiber or filament per unit length but is a measure specific to artificial and synthetic fibers. The latter are regular in cross-section, unlike natural fibers the cross-section of which varies and depends on the state of maturity of the fiber. The method meeting the requirements of standard ASTM D 3818-79 (fineness and maturity index of cotton fibers) has been applied to determine the fineness of cotton fibers whose mean micronaire value of 7.82 µg/inch, ones used for an outer layer making up the rough surface. The fineness or titer of the fibers was estimated to be 4.04 dtex, a value lower than the titer of the synthetic fibers utilized for the

rough surface of the wiping products described in European patent application No. 0 826 811.

The layers of cotton making up the product claimed for the invention may have an identical or different square meter weight (grammage). For example, the first layer, consisting of soft fibers and having a low micronaire value may have a grammage ranging from 10 to 40 to g/m^2 and the second layer, consisting of fibers exerting a rough effect, may have a grammage ranging from 10 to 300 g/m^2. Conversely, the layer consisting of soft fibers may have a grammage ranging from 10 to 300 g/m^2 and the layer consisting of fibers exerting a rough effect a grammage ranging from 10 to 40 g/m^2.

Another example, illustrated in FIG. 1, is that of a makeup removal product 1 having two layers. The first outer layer 2 has a low micronaire value and the second outer layer 3 a high micronaire value. The grammage of each of the two layers ranges from 50 to 250 g/m^2.

The product may also have more than two layers. One or more center layers are then positioned between the two outer layers, provided that the micronaire values of the fibers making up each of these two outer layers differ from one layer to another so as to obtain a soft surface and a rougher surface.

It is important for the outer layers to have a minimum grammage of 8 g/m^2 so as to provide an appreciable differentiation

effect and to neutralize the touch of the center layer or of one of the outer layers. In effect, increase in the grammage of each outer layer strengthens this differentiation while preventing decrease in the effect created, for example, by the soft fibers of one outer layer in contact with the other outer layer consisting of fibers termed rough and having too low a grammage or by a center layer with an average micronaire value, or again by soft fibers of a center layer positioned just below an outer layer made up of fibers termed rough and having too low a grammage.

Examples of the composition of products having more than two layers are illustrated in FIGs. 2 to 5.

FIG. 2 presents a diagram of a cross-section of a product 4 consisting of three layers of cotton. The first outer layer 5 has a grammage ranging from 10 to 40 g/m^2 and a low micronaire value. The second outer layer 6 also has a grammage ranging from 10 to 40 g/m^2 but has a high micronaire value. The center layer 7 positioned between the two outer layers has a grammage ranging from 50 to 300 g/m^2.

FIG. 3 presents a diagram of a cross-section of a product 8 consisting of three layers. In this instance, the first layer 9 has a grammage ranging from 10 to 40 g/m^2 and a low micronaire value, while the second outer layer 10 has a grammage ranging from 50 to 200 g/m^2 and a higher micronaire value. The

center layer 11 positioned between the two outer layers has a grammage ranging from 50 to 200 g/m^2.

FIG. 4 presents a diagram of a cross-section of another alternative embodiment of the product claimed for the invention. This product 12 comprises three layers, an outer layer 13 having a grammage ranging from 10 to 40 g/m^2 and a high micronaire value and another outer layer 14 having a grammage ranging from 50 to 200 g/m^2 and a low micronaire value, the two layers enclosing a center layer 15 having a grammage ranging from 50 to 200 g/m^2.

Lastly, FIG. 5 presents a cross-section of a product 16 comprising four layers of cotton. The first outer layer 17 has a low micronaire value and the second outer layer 18 a high micronaire value, the two having a grammage ranging from 10 to 40 g/m^2. The product also comprises two center layers 19 and 20 positioned between the two outer layers, each having a grammage ranging from 50 to 200 g/m^2.

The process of manufacturing the products claimed for the invention involves preparing at least two layers of cotton fibers making up the two outer layers of the product, one with a low micronaire value and the other with a higher micronaire value. The difference between the micronaire values of the two outer layers is at least 1 µg/inch. The layers may be made directly from hydrophilic bleached cotton. They may also be obtained on the basis of unbleached raw cotton subsequently treated chemically

so as to obtain water absorbency and bleaching. After the layers have been formed they are placed one on the other and are then joined by any known means such as means of adhesion or mechanical means such as calendering or needle felting. The joining means may also be hydraulic. Good joining may also be obtained by impregnation of the superimposed layers by any conventional prior art means such as passing through an impregnation bath, spraying, or introduction of a solution. This impregnation should be combined with expression compacting the layer and eliminating a part of the liquid contained in the wet layer as by calendering or passage over an air vent. A process of manufacturing and continuous joining layers is specified in European patent No. 0 681 621 issued to the applicant. In the latter case, impregnation of layers effected during various chemical treatment processes contributes to joining of these layers.

By preference the layers are joined by hydroentangling, that is, by means of streams of water under high pressure combined with expression by vacuum. Such joining may be effected with a device marketed by the ICBT-PERFOJET Company, Grenoble, France. This technique permits both joining of the layers to each other and joining of at least one surface of the sheet reducing linting of the products.

In the case of an unbleached fiber which is to undergo chemical treatment this stage of hydroentangling may take place

immediately after the stage of impregnation of the sheet as described in European patent application No. 0 735 175. It may also be the final phase of rinsing as specified in European patent No. 0 805 888 issued to the applicant.

Products are then cut in formats from the layers thus joined.

One of the advantages of the product claimed for the invention in the manufacturing phase is its composition entirely of cotton fibers. In effect, this permits easy recycling of the waste resulting from cutting in formats to create new products.

A user can distinguish the soft surface from the rougher surface simply by grasping and touching the product.

A softening agent may be sprayed exclusively onto the soft surface of the product in order to emphasize this difference. Consequently, the composition of the first outer layer of cotton with a low micronaire value will include a softener distributed over the surface of this layer.

In addition, visual differentiation of the product may be provided by various means.

For example, the outer layers may be dyed in advance with different colors or one surface is dyed and the other is left uncolored.

A mark may also be made in one of the outer surfaces in the form of an impression in order to identify it. Processes

involving use of engraved cylinders or calenders, heated if necessary, or use of a marking cloth may be applied.

By preference use will be made of the hydroentangling technique already applied to join the layers and prevent linting in order to provide visual differentiation of the two surfaces of the product.

This permits performance of three different functions by applying a single technique.

In this case the different layers are prepared and then superimposed; the resulting unit is then impregnated. The two outer layers are then hydroentangled one with the other on continuous rolls or cylinders.

The hydroentangling process permits different treatment of the two surfaces. In effect, the streams of water under high pressure used for entangling the fibers of the outer layers mark the surface of these layers with grooves visible to the naked eye the spacing of which corresponds to the distance between the streams. Specifically, the hydroentangling device includes a high-pressure pump feeding an injector positioned athwart the path of movement of the layer of fibers, over the entire width of this path. The injector consists of a volume of water under pressure closed off by a steel plate perforated with calibrated holes producing jets in the form of fine water needles under high pressure projected perpendicularly to the surface of the fiber

sheet. These fine jets entangle the fibers. The perforated holes in this steel plate (commonly termed a "strip") are of a diameter ranging from 100 to 200 µm, preferably 120 to 140 µm, and are spaced at regular intervals. The distance between the axes of two consecutive holes in the steel plate generally ranges from 0.5 to 3 mm, most often from 0.6 to 1 mm. Since the injector is stationary and the sheet or layer of cotton moves below the latter, a series of parallel grooves corresponding to passage below the jets is observed on the surface of the layer.

It is also possible to vary the distance between the axes of the holes in the plate of a hydroentangling device used for treatment of an outer layer in relation to the other device used for treatment of the other layer.

In order to obtain difference in the appearance of the two surfaces of the product use may be made for one surface, for example, of a hydroentangling device whose plate is perforated with holes spaced at a rather large distance of 1.2 to 3 mm, by preference 1.6 to 2.5 mm, and for the other surface of a device whose plate is perforated with holes spaced at a distance ranging from 0.4 to 1.2 mm, preferably from 0.5 to 0.8 mm. The grooves spaced at intervals of 1.2 to 3 mm will be more visible on the surface thus treated than the grooves on the other surface.

What is obtained is one surface with closely spaced grooves and the other with more widely spaced grooves.

An example of a product exhibiting this differentiation is illustrated in FIG. 6.

This product 21 comprises a first outer layer 22 with a micronaire value of 3.4 µg/inch and a grammage of 25 g/m^2, a second outer layer 23 with a micronaire value of 6.8 µg/inch and a grammage of 25 g/m^2, and a center layer 24 of 200 g/m^2.

The surface 25 of the outer layer 22 exhibits grooves 26 with a spacing d_1 of 0.6 mm and the surface 27 of the outer layer 23 grooves 28 with a spacing d_2 of 2 mm. The user is guided to distinguish the soft surface from the rougher surface of the product so as to use each of the surfaces of the product for its proper purpose, application and/or removal of makeup.

However, the increase in the distance between the holes in the perforated plate has as a direct result decrease in the number of holes and accordingly application of less energy to the sheet, something which cannot be offset by increase in the water pressure in the injector. This decrease in energy transmitted may cause increase in linting in relation to the result obtained with a sheet which has undergone a stage of hydroentangling by means of a perforated plate the distance between the holes in which is small and uniform. In order to limit this increase in linting use may be made of a plate perforated by holes in sequence, for example, groups of six holes spaced at intervals of 0.6 mm, each group being spaced a distance of 1.8 mm from the following one. A

surface is thus obtained in which the grooves are clearly visible because they are widely spaced, the spacing being of the order of 4.8 mm. Increase in linting is thus limited because of an average frequency of holes greater than that of a plate perforated at regular intervals, ones of 1.8 mm, for example. In this pattern example the average number of holes per meter is 1250, while this number is 555 in the case of holes regularly spaced at intervals of 1.8 mm. With a given hole diameter and pressure more than twice the energy can be applied with the plate perforated in this pattern than with a plate perforated at regular intervals of 1.8 mm.

FIG. 7 illustrates a plate perforated by holes in a sequence pattern, in this instance by a group of 5 holes spaced at intervals e_1 of 0.6 mm, each sequence or group of holes being spaced a distance of 1.8 mm from the following group.

In terms of the product this is expressed in a first outer layer having grooves with a specific spacing ranging from 0.4 to 1.2 mm (in this instance 0.6 mm) and a second outer layer comprising grooves in a pattern made up of several groups of grooves, each group of grooves being spaced a certain distance from each other, a distance ranging from 0.4 to 1.2 mm (0.6 mm in this instance) and each group being spaced from the following group at a distance ranging from 1.2 and 4 mm (1.8 mm in this instance).

There is thus made available to the user a cotton product the two surfaces of which differ from each other, a product which retains its properties of mechanical strength, resistance to linting, cohesion (resistance to separation of layers), and softness even if one of the surfaces is in effect rougher for cleaning purposes.

Claims

1. A product of hydrophilic cotton made up entirely of cotton fibers comprising at least one first and one second outer layer, characterized in that the first layer is made up of fine fibers having a low micronaire value forming a soft surface and the second layer is made up of fibers having a higher micronaire value forming a rough surface.

2. A product as specified in claim 1, wherein the first outer layer has a micronaire value ranging from 2 to 5 µg/inch and the second outer layer has a micronaire value ranging from 4 to 10 µg/inch, the difference between the micronaire values of the two outer layers being at least 1 µg/inch.

3. A product as specified in claim 2, wherein the first outer layer has a micronaire value ranging from 2.8 to 4.2 µg/inch and the second layer has a micronaire value ranging from 5 to 8.5 µg/inch.

4. A product as specified in one of the preceding claims, wherein the outer layers have a grammage of at least 8 g/m^2.

5. A product as specified in one of the preceding claims, wherein such product also comprises at least one center layer positioned between the two outer layers.

6. A product as specified in one of the preceding claims, wherein the outer layers have on the surface grooves, the distance between the grooves of one of the outer layers being smaller than the distance between the grooves of the other layer.

7. A product as specified in claim 6, wherein the distance between the grooves of the first outer layer ranges from 0.4 to 1.2 mm and the distance between the grooves of the second outer layer ranges from 1.2 to 3 mm.

8. A product as specified in claim 6, wherein the first outer layer comprises grooves with a certain spacing, such spacing ranging from 0.4 to 1.2 mm and the second outer layer comprises grooves in a sequence comprising a plurality of grooves, each group of grooves being spaced a certain distance from each other, such distance ranging from 0.4 to 1.2 mm and each group being spaced a certain distance from the following group ranging from 1.2 to 4 mm.

9. A product as specified in one of the preceding claims, wherein at least one of the outer layers is embossed.

10. A product as specified in one of the preceding claims, wherein the first outer layer, with a low micronaire value, includes a softening agent distributed more or less over the surface of this layer.

11. A process of manufacturing a product of hydrophilic cotton as specified in one of claims 6 to 8, characterized in that each outer layer is hydroentangled by means of streams of water the axes of which are spaced a certain distance from each other, this distance between the streams used for the first layer differing from the distance between the streams used for the second layer so as to obtain outer layers comprising on the surface grooves with different spacing.

12. Use of the product as specified in one of claims 1 to 10 for application of makeup and/or removal of makeup.